Integration of Problem Formulation to the RISK21 Framework

HESI RISK ASSESSMENT SUMMIT

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FEBRUARY 18, 2020
Problem Formulation - Background

“THE FORMULATION OF THE PROBLEM IS OFTEN MORE ESSENTIAL THAN ITS SOLUTION, WHICH MAY BE MERELY A MATTER OF MATHEMATICAL OR EXPERIMENTAL SKILL”

-- A. EINSTEIN
What is problem formulation?
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Who uses problem formulation?

Any industry where operating decisions are made to:
- Maximize profit
- Minimize risk
- Sustain long-term viability
- Maintain competitiveness

PF is key anytime planning, problem-solving or decision making are required

Sauve-Ciencewicki et al. 2019
Who uses problem formulation?

- Problem formulation is routinely used in
  - Urban planning
  - Chemical engineering
  - Process engineering
  - Computer programming
  - …
  - Risk assessment

The general principles of PF are independent on sector or discipline.
What is problem formulation?

An activity aiming at examining a problem in a **systematic** and **iterative** way to ensure that **all possible views** of the issue are considered, and guarantee the **best adapted, most effective, efficient and transparent solution**.
What is problem formulation?

Problem Framing
- Context
- Scope
- Boundaries
- Deadlines
- Resource constraints
- ...etc.

Problem Exploration
- What do we know?
- What are the data gaps?
- Prioritize information
- Develop hypotheses

Approach Mapping
- Develop strategies for hypotheses testing

IMPELENTATION

Sauve-Ciencewicki et al. 2019
Why is problem formulation important?

- The structured and systematic process of PF ensures:
  - A better understanding and definition of the issue
    - Better communication among stakeholders
  - The development of quality solutions that are:
    - Focused
    - Effective
    - Efficient
    - Consensual
Problem Formulation and RISK21
Nudging RISK21 users towards PF

Key questions to explore the context and produce a robust problem statement

- What do you know?
- What do you need to know?
- How do you know when you know enough?

**Enough precision to make a decision?**
Conceptual model builder

- Use before plotting data on the RISK21 matrix
- Step-by-step approach leading the user to consider key information
  - Scope of the assessment
  - Source(s) of contaminant
  - Routes of exposure
  - Target organisms

Problem Formulation:
Do the industrial and commercial uses of perchloroethylene present a risk for human health?
The big picture
An iterative process:

1. Problem Formulation
   - Tiered data gathering (n=0-3)

2. Exposure
   - Tier 3
   - Tier 2
   - Tier 1
   - Tier 0

3. Toxicity
   - Tier 3
   - Tier 2
   - Tier 1
   - Tier 0

   n > 0
   n = 0

   Enough precision for decision?
   - Yes
   - No

   Should the CM be refined?
   - Yes
   - Conclude

Conclude
www.risk21.org/webtool
Positive feedback on RAFT

- Presentation to EPA (Risk Assessment Division)
- 2 training sessions in Brazil
- Presentation to Health Canada
Visit www.RISK21.org

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